

# Notice of Allowability

Application No.

10/817,623

Examiner

Steven J. Fulk

Applicant(s)

TAKEDA ET AL.

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed 10/10/08.
2. ☒ The allowed claim(s) is/are 1-18,33,35 and 37.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☒ Certified copies of the priority documents have been received in Application No. 09/604,100.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material

5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

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## **DETAILED ACTION**

### ***Reissue Applications***

1. The Supplemental Reissue Declaration filed December 3, 2008, which pertains to the limitations added to claims 2 and 12 in the amendment filed October 10, 2008, has been accepted.

### ***Response to Arguments***

2. Applicant has amended claims 2 and 12 to overcome the rejection under 35 U.S.C. 251. Therefore, the rejection of claims 2-13, 35 and 37 has been withdrawn. Claims 1, 14-18 and 33 were previously indicated to be allowable subject matter.

### ***Allowable Subject Matter***

3. Claims 1-18, 33, 35 and 37 are allowed.

4. The following is an examiner's statement of reasons for allowance: a search of the prior art failed to disclose or reasonably suggest a semiconductor device manufacturing method of forming a second conductivity-type region by irradiating impurity ions onto semiconductor substrate; wherein the irradiating impurity ions is performed to form a junction structure comprising a vertical junction group where a first conductivity-type region and the second conductivity-type region are alternatively arranged vertically to a surface of the semiconductor substrate; and wherein the impurity ion irradiated region is restricted by a shield mask intercepting the impurity ions and the impurity ion acceleration energy is controlled to provide a uniform impurity distribution in the direction of irradiation in the second conductivity-type region, as recited by independent claims 1 and 12.

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A search of the prior art also failed to disclose or reasonably suggest a semiconductor device manufacturing method of forming at least one of a first and second conductivity-type regions in a semiconductor substrate by selectively irradiating impurity ions onto the semiconductor substrate; wherein the selectively irradiating impurity ions is performed to form a junction structure comprising a vertical junction group where the first conductivity-type region and the second conductivity-type region are alternatively arranged vertically to a surface of the semiconductor substrate; and wherein the impurity distributions in the first and second conductivity-type regions are uniform in the direction of irradiation, and the impurity ion acceleration energy and the area of each region irradiated by the impurity ions are controlled so that the cross-sectional shape and cross-section area of the first and second conductivity-type regions on planes perpendicular to the direction of irradiation are uniform in the direction of irradiation, as recited by independent claim 2.

A search of the prior art also failed to disclose or reasonably suggest a semiconductor device manufacturing method of forming an N<sup>+</sup> region by irradiating a neutron beam onto a semiconductor ingot having a P<sup>+</sup> region; wherein the incident direction of the neutron beam is collimated to make the cross-sectional shape and the cross-section area of the N<sup>+</sup> region on planes perpendicular to the direction of irradiation uniform along the direction of irradiation, and the impurity distribution in the N<sup>+</sup> region is controlled to be uniform along the direction of irradiation, as recited by independent claim 14.

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Komori '882 teaches a semiconductor device manufacturing method of forming a second conductivity-type region by irradiating impurity ions onto semiconductor substrate, but the reference does not teach the irradiating impurity ions to be performed to form a junction structure comprising a vertical junction group where a first conductivity-type region and the second conductivity-type region are alternatively arranged vertically to a surface of the semiconductor substrate; nor does the reference teach forming an N<sup>+</sup> region by irradiating a neutron beam onto a semiconductor ingot having a P<sup>+</sup> region.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

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**Conclusion**

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven J. Fulk whose telephone number is (571)272-8323. The examiner can normally be reached on Monday through Friday, 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

6. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Steven J. Fulk  
Patent Examiner  
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December 9, 2008

  
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